

THE EFFECTS OF FIRE ON *PENSTEMON LEMHIENSIS*  
INTERIM MONITORING REPORT  
1997 AND 1998

By  
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For  
Beaverhead-Deerlodge National Forest  
and  
Bureau of Land Management

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## INTRODUCTION

This interim report summarizes data from the third and fourth years of monitoring *Penstemon lemhiensis* (Lemhi penstemon) to determine the effects of fire on the species, and update the results from the first two years of monitoring that were reported earlier (Heidel and Shelly 1997). Prescribed burns took place at two of the three study sites since the first report, so this update includes the first post-burn data collected in the study.

Fire response research was identified in the interagency conservation strategy (Elzinga 1997) as one of three critical conservation research needs for the management and recovery of *Penstemon lemhiensis*. Demographic monitoring studies had shown that the population numbers had significantly declined at two of three sites over the previous four to six years. High mortality among seedlings was also documented during this time, and no life-cycle completion (from germination to flowering stage) was observed among any of the new cohorts during this period (Shelly and Heidel 1995).

## STUDY SITES AND METHODS

Two monitoring sites on U.S. Forest Service and Bureau of Land Management lands that were originally used for monitoring demography and identifying key life history "bottlenecks" were subsequently used for monitoring the effects of fire (Badger Pass Microwave and Badger Pass North). In addition, a new monitoring site for the fire effects study was established at Canyon Creek. The low numbers of plants and the microhabitat variability precluded use of paired experimental controls matching treated and untreated areas, so that the only "controls" are represented by the pre-burn data for each site. Study site selection and monitoring design are detailed in Heidel and Shelly (1997). Sample sets are referred to by site name and sample area layout; whether transect or plot.

Populations at all three of the sites represent key "Class A" populations (Elzinga 1997); i.e., among the limited number of populations rangewide that have ever been documented in excess of 100 plants. Incidental to this study, we re-read the two Forest Service demographic transects on French Creek that were not included in the fire effects study. The re-reading was done in 1997 as an indication of trend for the only other nearby "Class A" population.

The study was established to monitor life history changes for these populations rather than to document population-wide trend. The plots were placed so as to represent the highest local densities of the species and some significant fraction of total numbers, and demographic results indicated that establishment is concentrated near parent plants (Shelly and Heidel 1995), so the data are an indication of trend as well. Calculations for recruitment, establishment, and mortality rates for all sample sets are pending.

The original intent was to set up controlled experimental conditions in which concurrent prescribed burning was the only treatment. However, each of the burn treatments took place at different years or different times of year. In addition, there was a short, intense use by livestock at the Canyon Creek sites in July of 1997 (after the West Quadrat burn, but before the East Quadrat burn); this area ordinarily receives little to no grazing use. There was prolonged, but more dispersed, use by livestock at the Badger Pass North site after burn treatment. The grazing confounds drawing conclusions about the effects of fire, and is only partially addressed by inference, based on field notes regarding plant damage and soil trampling that were taken when the monitoring plots were read. Post-burn vegetation composition data was not delayed until 1998 because vegetation cover was dramatically reduced by the grazing episode.

Complicating factors were also introduced in the Badger Pass Microwave transects, even though it lies within an exclosure. In the interest of minimizing damage to the exclosure, the scattered Douglas-fir trees were felled in (GET DATE), cut into sections, and left lying within the exclosure. Prescribed burn treatment did not take place in the same year, and the transects could not be read in 1998 because of the many scattered logs on the transects.

Canyon Creek West was burned in the fall of 1996. Canyon Creek East and Badger Pass North were burned in (the fall of?) 1997, and Badger Pass Microwave was burned in the fall of 1998. A complete record of burn conditions (including burn dates, size of area burned, and intensity class) are needed for documentation and final analysis.

## PRELIMINARY RESULTS

Raw spreadsheet data presents the life history stage in the monitoring areas (Appendix A) as spreadsheets for the Forest Service transects, the BLM transects, and the combined Forest Service and BLM quadrats; identified separately by name. In total, they represent

annual data for almost 1,200 plants over time. The data are also summarized as "coarse trend" bar graphs, to show the overall population numbers and structure during each year of monitoring (Appendix B) in each of the three main life history stages (flowering, non-flowering, seedling).

All four sample areas on Badger Pass North and Canyon Creek saw net increases in the number of established plants (flowering+non-flowering) compared to the start of the monitoring study (Appendix B.) Despite the mortality associated with prescribed burn treatments for plants at all life history stages, there was survivorship in each of the life history stages as well. The major increases in germination and recruitment have subsequently compensated for this mortality, and resulted in a net gain of established plants. This will be quantified and examined more closely in the final report.

The data compilation and analysis that has been completed to date will be completed to include demographic analysis and reviewed to define all of the statistical methods and analyses in the final product at the end of monitoring.

## DISCUSSION

The level of decline and subsequent post-burn rebound in established *Penstemon lemhiensis* plants was particularly dramatic in the Badger Pass North transect (Appendix B. Badger Pass North Transect) compared with Canyon Creek. This site has the same "category" of habitat among the seven kinds of habitat defined by Elzinga (1997) - a shallow rangeland type - as Canyon Creek, but is in a foothills setting rather than a montane setting. In addition to the fundamental climate differences in these settings, there were treatment differences, and gross vegetation structure differences in pre-burn conditions. It is interesting to note that the Badger Pass site experienced a complete post-burn canopy cover conversion (forb cover values switching with grass cover values), unlike the Canyon Creek East Plot, where a decrease in the cover of *Artemisia tridentata* ssp. *vaseyana* was the only major vegetation change between pre- and post-burn conditions (Appendix C).

We note that one of the French Creek monitoring transects at Discovery Mine also saw a net increase in established plants in the absence of any prescribed burn treatment. It is oriented along a drainage course and may just reflect a return from a drought cycle. Climate data records are needed to interpret results.

The accompanying changes in vegetation composition and structure were recorded in ecodata samples within the study site quadrats. Complete pre- and post-burn data are given in Appendix C, separately summarized and graphed in Appendix D for all species contributing at least 5% estimated canopy cover in pre- or post-burn conditions. The general nature of the vegetation is one more piece of information needed to examine species' response.

This management response research shed further light on species' life history. There are several preliminary observations that can be made as completion of this work is planned.

1. There is a large seedbank that can remain viable for at least several years. Despite the virtual absence of flowering plants in the Badger Pass North transect for the past five to six years, and a flush of germination in one wet year (1993) prior to the prescribed burning, there was an even larger flush of germination in 1998, the summer after burning. This 1998 seedling cohort could only have arisen from a seedbank. The seed chilling experiment of Meyer (cited in Appendix J - Heidel and Shelly 1997), in combination with these field results, may meet the separate research need for seedbank species germination studies identified by Elzinga (1997).

2. There is plasticity in the life history stages that do not uniformly correspond with age. In the original monitoring work, it became clear that there are "prolonged juvenile" plants that fail to produce large rosettes of leaves, yet they are more than one year old. These were put in a special "c" size class as multi-year plants that remain in "seedling"-sized stages of development. Conversely, at the Badger Pass North site in 1998, we encountered "gangbuster adult" plants that made their first-time appearance and produced fully-formed rosettes within a single year.

If the net increase in mature plants holds for the burn treatment sites after the 1999 monitoring results are available, then the original plans to complete the data analysis after this year's monitoring are on track for these sites (Canyon Creek and Badger Pass North). Badger Pass Microwave was burned in 1998, and requires separate consideration.

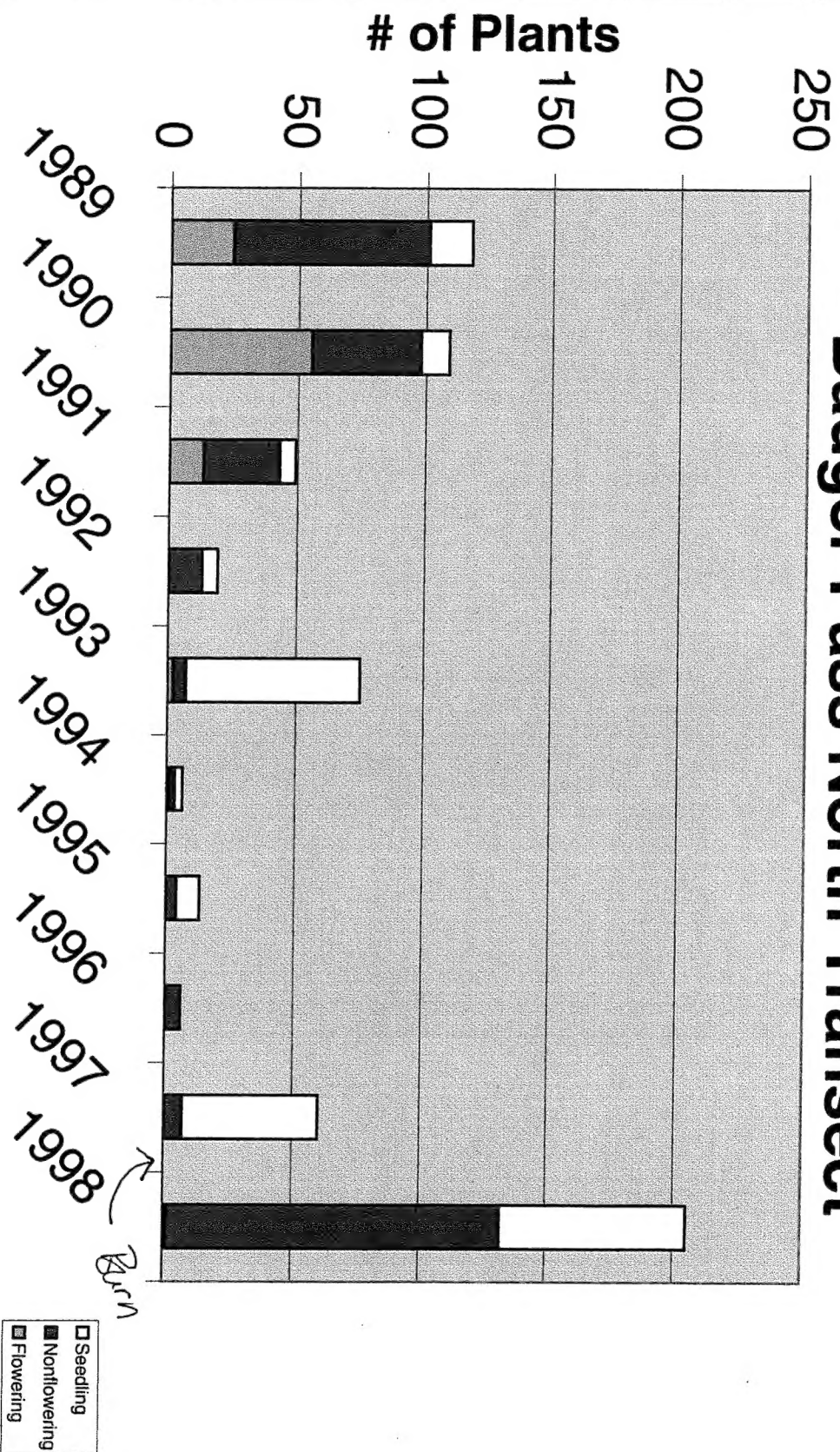
#### LITERATURE CITED

Elzinga, C. 1997. Habitat conservation assessment and conservation strategy for *Penstemon lemhiensis* (Lemhi Penstemon). Unpublished report to the U.S. Forest Service and Bureau of Management. 49 pp. + app.

Heidel, B. and J. S. Shelly. 1997. The effects of fire on *Penstemon lemhiensis* - monitoring establishment report, 1995 and 1996. Unpublished report to the Beaverhead-Deerlodge National Forest and Bureau of Land Management. Montana Natural Heritage Program, Helena. 11 pp. + app.

Shelly, J. S. and B. Heidel. 1995. Demographic monitoring of *Penstemon lemhiensis* in southwest Montana. Unpublished report to Beaverhead National Forest and Bureau of Land Management. Montana Natural Heritage Program, Helena. 9 pp. + app.

# **Penstemon lemhiensis - Badger Pass North Transect**





## MONTANA NATURAL HERITAGE PROGRAM

1515 East Sixth Avenue  
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May 24, 1999

Dan Svoboda  
Beaverhead-Deerlodge National Forest  
420 Barrett St.  
Dillon, MT 59725

Dear Dan:

Enclosed are the results of 1997-98 *Penstemon lemhiensis* monitoring from Badger Pass North and Canyon Creek, under Challenge Cost Share Agreement No. 11-01-02-95-37. This represents the interim product for the past two-year period, and a common frame of reference for bringing a species recovery study to completion. Included with the summary report are:

1. The data tables tracking life history stage of each individual
2. The "coarse trend" bar graphs showing the overall shifts in population numbers
3. Pre- and post-burn results of ecodata documentation

The Badger Pass Microwave results on BLM land are included for comparison.

If the net increase in mature plants holds for all sample sets in 1999 monitoring, then original plans to complete the analysis after this year's monitoring are on track, including the life history calculations if not transition matrices of demographic research. By that approach, we would request the full length of winter to complete analysis, moving the expiration deadline from the end of December to March.

Are there records of burn conditions that could be sent, including at least date, size, and characterization of intensity? This would be an improvement over pasting together incomplete notes from phone conversations about prescribed burn treatments.

This is a busy season for you, too – let us know if any copies need to be sent to district offices. Comments and questions are welcome at any time.

Sincerely,

Bonnie Heidel

C: John Joy, Brian Hockett